Low Control Software Acquisition Plan -Example - 1a
Version 2.1

Text in Italics is provided for explanatory purposes only.
The following log gives the background and context under which this Software Acquisition Plan was written.

Software Managers' Log File for the WHATSIT Project

Background

(a) During competition, the support contractor demonstrated that it has the proven organizational capabilities and experience to deliver quality software on time, and within budget; and has acceptable evidence of software management, engineering, and assurance standards, processes, and practices to produce quality software.
(b) The WHATSIT software development effort has no requirements in the following areas: Health, Safety, Systems Administration, and Security.
(c) This software is not intended to be delivered/released to any organization outside of NASA.
(d) The Software Manager will place all software products, and related documents, including the Software Acquisition Plan, under configuration control according to the WHATSIT Project Configuration Management Plan (v2).
(e) . . .

Risk Management

The Software Manager has completed the on-line Risk Rating Sheet with 'Time Pressure' and 'Staff Competency' both rated 3. No other risks are known at this time.

1. Risk Title: Time Pressure

Condition: The WHATSIT Project may be losing a key member of the staff (Marlena Deitric) to another project. Her PMACS work *(i.e., WBS element 8.0, which is a complete and severable task)* is on the critical path of the WHATSIT schedule.
Consequence: The Project may suffer a schedule slip.
Mitigation Plan:
a) Contract out Marlena's PMACS work.
b) . . .

2. Risk Title: Staff Competency

Condition: This is the first time the support contractor has developed this type of software and their expertise is limited in this area.
Consequence: Overruns may occur and the delivered software may not be of good quality.
Mitigation Plan:
a) Require the contractor to do more detailed Risk Management than is usually employed on a Low-control software project and monitor the schedule closely.
b) Divert the WHATSIT Project funds for the lowest priority requirements to use as contingency funds if …

Resources

a) . . .
b) Based on previous work, a rough order estimate is that 1800 hours will be needed to complete the PMACS work.
c) . . .

Task Order Cost/Funding

It is anticipated that a proposed task order consisting of a Software Acquisition Plan would be issued to the contractor with a "not to exceed" amount of cost/funding allocated for development of the proposed SPMP. Upon delivery of the proposed SPMP, cost/funding and schedule would be negotiated for completion of the

task. The cost /funding/schedule will be revisited upon completion of the Software Requirements Document. *(Note that this example assumes a cost-reimbursement task.)*

Approval Records
The email from Phillip Morris, the requester, giving permission to proceed with the software project after the software class and the estimated resources had been relayed to him is in the Eudora folder "Projects\PMACS \Approvals" dated 4/2/99.

The email from Janet Amberly*, the supervisor, authorizing the Software Manager's time on this project is in the Eudora folder "Projects\PMACS \Approvals" dated 4/12/99.*

The email from Phillip Morris authorizing the Software Acquisition Plan is in the Eudora folder "Projects\ \PMACS \Approvals" dated 4/12/99.

The email from Phillip Morris authorizing the Software Project Management Plan is in the Eudora folder "Projects\ \PMACS \Approvals" dated 4/18/99.

Acceptance Records
The email showing the Software Managers Acceptance will be kept in the Eudora folder "Projects\ \PMACS \Acceptance".

Metrics Records
The email showing the contractor delivered metrics specified in the Software Acquisition Plan will be kept in the Eudora folder "Projects\ \PMACS \metrics".

The following provides an example of a Software Acquisition Plan for starting a new task issued under an existing contract. The example represents a moderately complex project. This level of detail may not be appropriate for all Low-Control class projects.

Software Acquisition Plan

Software Project Title: Phased Microphone Array Control System (PMACS)	
File Name/Ver: PMACS-SAP-ver1-rev0.doc **Date of Issue:** 4/13/1999	**Software Class:** Low
Supervisor: Ms. Janet Amberly (SAP approved on 4/12/1999)	**Software Manager & NASA Point of Contact:** Julie Andrews, ABC Competency, XYZ Branch **Percentage of time allocated to this role:** 15%
Contractor: Software Systems, Inc. (SSI) **Contract:** NAS1-12345	**Requester :** Phillip Morris, WHATSIT Project Manager (SAP approved on 4/12/1999)

1. Scope of Acquisition Plan

The PMACS software shall provide a PC/Windows-based software control-panel application to control a 36-channel Bruel and Kjaer Nexus Microphone Power System (BKMPS) over an RS-232 serial communication link. The software shall also … Limited maintenance for the system is required.

2. Requirements

SSI shall provide all PMACS products defined below.

2.1 Requester Requirements

(a) The software shall provide a PC/Windows-based control panel interface to the user.
(b) The software shall interface to and control a government-owned 36-channel BKMPS.
(c) The software shall provide interface software modules used to control the power supplies over an RS-232 serial communication bus.
(d) The graphical user interface (GUI) control panel application shall permit control of all microphone power-supply channels and shall allow power supply settings to be saved and recalled from the disk.
(e) The control panel shall also contain an HTML-based on-line help function to provide operation and problem solution information to guide the user through the setup of individual microphone excitations, sensitivities, and gains.
(f) The . . .

2.2 Constraints:

(a) All documents shall be delivered in Microsoft Word (v7.0).
(b) All code shall be written in the current ANSI standard C++ format.
(c) All code shall be compilable using the Microsoft C++ (v7.0) compiler.
(d) All products shall be delivered on the XYZ Branch Server under the directory C:\Projects\Morris\PMACS\Deliverables. This directory contains two subdirectories (i.e. Draft, and Final). Upon completion, deliverables shall be placed in the appropriate directory with a file name containing the acronym for the project name and the abbreviated name of the deliverable item (see Section 3 for the Deliverable Items list). SSI shall notify the Software Manager via e-mail once deliverables are transferred to the XYZ Branch Server.
(e) The development of the deliverables shall be at the contractor's facilities.
(f) The Acoustics Laboratory (Building 1208, Room 231) equipment shall be used for Acceptance Testing.
(g) The . . .

2.3 General Requirements

(a) The LaRC functions and products required of the contractor for Low-control software class are as follows:

-That the contractor must deliver a Software Project Management Plan (SPMP) addressing the requirements given in LMS-CP-5528 Section 3, excluding paragraph 3.1.2 (LMS-CP-5528 is provided in Attachment 1)
-That the SPMP must be baselined following the contractor's Configuration Management Plan
-That the contractor's primary point of contact be identified to the Software Manager
-That detailed tasks must be assigned to qualified software project team members
-That software activities must be performed according to the authorized SPMP
-That start and end dates of the SPMP schedule elements must be updated and reported to the Software Manager as the schedule changes
-That a Software Version Description must be documented and submitted to the Software Manager with each delivery that contains the following information; project title, date of delivery, point of contact, inventory of all baselined configuration items to be delivered, including unique configuration item identifier and description, instructions for reading and installing configuration items, and a description of all changes incorporated in this delivery
-That the contractor must deliver information required to complete the Software Metrics Collection Sheet, located at: http://sw-eng.larc.nasa.gov/process/forms.html

(b) The SPMP shall cover all activities required to complete the project. All planning information (including a schedule and maintenance plan) shall be included in the SPMP or rolled out as separate documents.

(c) Software development activities shall not be performed before the Software Manager's approval of the Proposed SPMP.

(d) At a minimum, the following information shall be included in the Software Requirements Specification (SRS): (1) Project title, (2) Date, (3) Issuing Organization, (4) References, (5) System Identification and overview, (6) Functionality and performance of software, (7) External interfaces, (8) How each requirement will be validated [demonstration, test, analysis, or inspection], (9) Human-machine interfaces, (10) Data definitions, (11) Design and implementation constraints, (12) Outputs of the software, (13) Computer resource requirements *(e.g. memory required, disk space, platform)*, and (14) Requirements traceability. A GUI will be prototyped and demonstrated to the Software Manager to collect feedback before delivery of the SRS.

(e) At a minimum, the following information shall be included in the Software Qualification Test Procedure: (1) Project title, (2) Date, (3) Issuing organization, (4) References, (5) Identification of test configuration, (6) Test preparations (hardware, software, other) for each test, (7) Test descriptions [including a) Test identifier, b) Requirements addressed, c) Prerequisite conditions, d) Test input, e) Expected test results, f) Criteria for evaluating results, g) Instructions for conducting procedure], and (8) Requirements traceability.

(f) At a minimum, the following information shall be included in the Software Qualification Test Results Report and in the Acceptance Test Results Report: (1) Project title, (2) Date, (3) Issuing organization, (4) References, (5) Detailed test results [including a) Test identifier, b) Test summary, c) Problems encountered, d) Deviations from test procedures], and (6) Test log *(i.e. actual test output and results summary)*.

(g) At a minimum, the following information shall be included in the Software Version Description Document *(i.e., Software Configuration Index Record)*: (1) Project title, (2) Date of delivery, (3) Issuing organization, (4) An inventory of all delivered items *(i.e., filenames, description, location on the "XYZ Branch Server", date and time file last saved, version number if not included in the file name, file location)*, (5) Identification of changes incorporated, (6) Identification of all known problems, (7) The name of the read-me file that includes instructions for building the executable object code, including, for example, the instructions and data for compiling and linking, and the procedures used to recover the software, perform software regression testing, or modification, and (8) the file name and location of the associated Software Requirements Description and Software Qualification Test Procedures.

(h) At a minimum, the following information shall be included in the Monthly Status Report: dates that the report covers, Action Items, person assigned, status of Action Items, summary of status of products/deliverables, baselines, and verification activities, problems encountered, deviations from the SPMP, and a copy of the Risk Spreadsheet (Attachment 2). After review of the monthly status report, meeting minutes shall be delivered to the XYZ Branch Server under the directory

C:\Projects\Morris\PMAS\Deliverables\Final\Monthly Status Minutes and an e-mail message shall be sent to the Software Manager when they are delivered.

3. Life Cycle and Approach

At a minimum, life cycle "D" as defined in Guidance on LMS Software Procedures (URL: http://sw-eng.larc.nasa.gov/process/) shall be used by the contractor on this project. The contractor may choose to add additional phases to life cycle D. The contractor may choose the development approach deemed most appropriate for this project.

4. Deliverables Record:

The following table specifies the software project deliverables.

Deliverable Item	Schedule for Delivery
1. Proposed SPMP[1]	· Within 2 weeks after receipt of this Software Acquisition Plan
2. Software Requirements Description[1]	· According to the schedule in the authorized Proposed SPMP · After government or contractor requested changes in the Software Requirements Description are authorized
3. Revised SPMP[1]	· Concurrent with delivery of the Software Requirements Description · As required to keep the SPMP current
4. Help Files[1]	· Prior to Qualification Test Phase · At the completion of Qualification Testing of each maintenance event if changes occur
5. Software Qualification Test Procedures[1]	· Prior to Qualification/Validation Testing · Whenever qualification test procedures are changed
6. Software Qualification Test Results Report[1]	· At completion of Qualification/Validation Testing · After completion of Qualification/Va lidation Testing of each maintenance event
7. Source Code Files	· After completion of Qualification/Validation Tests · After completion of Qualification/Validation Testing of each maintenance event
8. Object Files	
9. Executable Files	
10. Make Files	
11. Software Version Description Document *(i.e., Software Configuration Index Record)*[1]	· With each software delivery to the requester · At completion of maintenance effort
12. Acceptance Test Results Report	· With each delivery of the source code, after Acceptance Testing is complete
13. Joint Review Agendas	· Four working days prior to the Joint Review
14. Joint Review Minutes	· Within 3 working days after the Joint Reviews
15. Formal Inspection Records	· Within 10 working days after inspection
16. Monthly Status Report	· Within 3 working days after the end of the reporting month
17. Risk Spreadsheet	· Initially, the contractor will provide the Risk Spreadsheet to the Software Manager with the Proposed SPMP. · Thereafter, the contractor will provide updated risk information at Joint Reviews, on Monthly Status Reports, and on an as needed basis if the risk information changes and the contractor deems it necessary to inform the Software Manager.

[1] This item shall be provided in draft form a minimum of four working days before the Joint Review of the item. This Deliverable Item represents the product after it has been revised to incorporate changes agreed upon during the associated Joint Review.

18. Metrics Collection	· The following data, required on document 193, (see Attachment 4) shall be provided for the Work Breakdown Structure (WBS) element specified at the time the Proposed SPMP is submitted and shall be resubmitted as changes to this data occur: start date, end date, full-time equivalent (FTE), SPMP location. · Original estimates for the following shall be provided for the project: Estimated Start Date, Estimated Completion Date, Estimated Total Staff Hours, and Estimated Total Cost. · Actuals for the following shall be provided at project completion, prior to the start of maintenance: Actual Start Date, Actual Completion Date, Actual Total Staff Hours, Actual Total Cost, Total Executable Source Lines of Code for Each Language Used, COTS or GOTS Tool(s) Used and Comment on Satisfaction, Platforms · Optional Metrics, to be completed at the contractor's discretion and delivered at project completion: Methods Used and Comment on Satisfaction, Lessons Learned and Feedback, Best Practices · Six months after project completion the following shall be provided: number of approved problem reports implemented and the hours spent performing the corrections. For further explanation of specific metrics see: http://sw-eng.larc.nasa.gov/process/sheets.html

5. Trade Study

There is no known software that is available "off-the-shelf" for this application. A representative from Bruel and Kjaer Nexus was contacted to ascertain the availability of software that might exist, but knew of no known source. A search of the internet for a software package produced no results. Based on the non-existence of any "off-the-shelf" software, it is necessary to develop the software.

6. Reviews, Verification, and Validation

6.1 Joint Reviews

The contractor shall provide the agenda and all documents to be reviewed as draft copies to the Software Manager a minimum of 4 days before the scheduled Joint Review of that product. Section 3 provides the schedule for deliverables. The actual schedule dates for Joint Reviews will be negotiated with the contractor and included in the SPMP.

The contractor shall conduct the following Joint Reviews:

(a) Review of the Proposed SPMP.
(b) Review of the draft Software Requirements Description to verify that the requirements are complete, clear, technically consistant, consistant in terminology and logic, testable, unambiguous, free of undefined terms/acronyms, and accurate and review the Revised SPMP.
(c) Review of the draft Help Files to ensure they are complete, correct, and to the proper level of detail.
(d) Review of the draft Software Qualification Test Procedures to ensure they cover all user and software requirements.
(e) Review of the Software Qualification Test Results Report to ensure that the actual results conform to the expected results.
(f) Review of the Software Configuration Index Record *(i.e. Software Version Description Document)* and Acceptance Test Results Report.

Reviews will be conducted as Formal Inspections *(see Instructional Handbook for FormalInspections, http://sw-eng.larc.nasa.gov/process)* where the recorder will be the Software Manager and the moderator will be provided by the contractor. Completed Formal Inspection records will be retained in the XYZ Branch Formal Inspection file cabinet (Building 1208, Room 230) for a minimum of six months after project completion.

At a minimum, the following information shall be included in the Joint Review Agendas: technical, cost, staffing, and schedule performance against the SPMP; status of action items, products/deliverables, and problems encountered; requested changes to the SPMP; updated Risk Spreadsheet; and draft deliverables to be reviewed.

At a minimum the following shall be included in the Joint Review Minutes: agenda, attendees and associated organization, date of review, technical product(s) reviewed, action items, person assigned, status of action items, summary of status of - technical, cost, staffing, and schedule performance against the SPMP, changes to the SPMP, status of products/deliverables/problems, a copy of the risk spreadsheet, and results of reviews *(e.g., "product approved once requested changes documented during the inspection are completed and verified", "product failed inspection and a re-inspection is required after the requested changes are completed and verified")*. Minutes shall be delivered to the XYZ Branch Server under the directory C:\Projects\Morris\PMAS\Deliverables\Final\Review Minutes and an e-mail message shall be sent to the Software Manager when they are delivered.

6.2 Verification and Validation
Verification and Validation activities shall be performed by the contractor. Results of those activities shall be covered at Monthly Status Reports.

7. Development Schedule
The requested completion date is September 15, 1999 with a maintenance completion date of March 21, 2000. Initial scheduling information is specified in section 3.

8. Acceptance Procedure and Criteria
The following defines the acceptance procedure and criteria that shall be used:
(a) With the Software Manager observing, the contractor shall successfully compile the software on the PMACS computer ensuring there are no syntax and/or logical errors.
(b) Software Qualification Test Procedures shall be repeated by the contractor on the PMACS computer and be witnessed by the Software Manager during acceptance testing to validate that the product does in fact meet the requirements contained in the acquisition plan and Software Requirements Description.
(c) The Software Manager will perform "hands on" testing by exercising the software as a user for a period of five-days.
(d) Documentation shall be complete and accurate and must be reviewed and approved by the Software Manager.
(e) Errors or problems observed will be recorded by the contractor and shall be corrected before acceptance. The Software Manager will witness the contractor retest of the software corrections before acceptance.
(f) Upon completion of the Acceptance testing phase, the Software Manager will generate an acceptance e-mail that will serve as a record of PMACS software acceptance.

9. Risk Management
The following risk management practices are applicable:
(a) The contractor shall document all known risks (including those on the Risk Rating Sheet greater than 2) with medium or high probability and medium or high impact. The contractor shall document and deliver an associated mitigation/avoidance plan for the top five of those risks.
(b) The following definition of risk attributes shall be used:
High Probability – Likelihood of occurrence is greater than 70%.
Medium Probability – Likelihood of occurrence is between 40 and 70%.
Low Probability – Likelihood of occurrence is less than 40%.
High Impact – Schedule delay of 3 weeks, or cost overrun of greater than 6%.
Medium Impact – Schedule delay of 2 weeks, or cost overrun of 3 to 6%.
Low Impact – Schedule delay of less than 2 weeks, or cost overrun of less than 3%.
Near Time Frame – 2 weeks.
Far Time Frame – 5 weeks.

(c) The contractor shall continuously monitor the project for risks and update risk plans *(e.g. risk to quality, technical content, development costs, schedule, or effort).*
(d) Risk information will be conveyed to the Software Manager using the spreadsheet format provided in Attachment 2.

Note: the level of risk management detail provided in this example is not required for low-control projects but is provided purely for example purposes.

10. Installation and Operations
There are no requirements under this software acquisition plan for installation beyond those to support acceptance testing. There is no requirement under this software acquisition plan for operation support of the software.

11. Maintenance
The contractor's maintenance activities shall include the following:
(a) Maintenance will be limited to fixing logic errors and minor enhancements for the first six-months after software delivery.
(b) The price to complete this project shall include error fixes for the first 6 months and up to 60 hours to be spent on enhancements as directed by the Software Manager. The contractor shall track these hours separately.
(c) Once changes are complete, qualification and acceptance activities will be performed as defined above.
(d) The contractor shall base its maintenance processes on IEEE 12207 clause 5.5 and provide a maintenance plan. The maintenance plan may be included in the SPMP or rolled out as a separate document.
(e) The contractor shall identify in the maintenance plan how problems and/or modifications are identified, classified, prioritized, tracked, and analyzed; and the approval, implementation, and test process to be used.
(f) The Trouble Reports and Change Requests will be tracked using the NASA developed and freely distributed Software Metrics Database available at http://sw-eng.larc.nasa.gov/metrics/public/index.htm.

12. Configuration Management
The contractor shall configuration manage all products according to the requirements specified in LMS-CP-5529 (see attachment 4). The configuration management plan may be included in the SPMP or rolled out as a separate document.

14. Changes to the Software Acquisition Plan
If changes to the Software Acquisition Plan are needed, they will be performed by the Software Manager and configuration controlled according to the WHATSIT Project Configuration Management Plan (v2) before release.

15. Government Furnished Items
The following items will be provided by the Software Manager to the contractor and shall be returned to the government before acceptance of the source code.
(a) Bruel and Kjaer 36-channel Nexus system.
(b) RS-232 Serial Cable.
(c) PC RS-232 Serial Port Card.
(d) Bruel and Kjaer Nexus Interface Design Document.
(e) Bruel and Kjaer Nexus User's Manual.

Attachment 1: Langley Management System - Center Procedure - 5528
See e-mail attachment '5528.pdf' for LMS-CP-5528 and Revision B.

Attachment 2: Risk Spreadsheet
See e-mail attachment 'Risk Spreadsheet - Example 1, V1, R0.xls' for Excel Risk Spreadsheet template.
Note: See the following URLs for the example Risk Spreadsheet.
Excel Version: http://sw-eng.larc.nasa.gov/process/forms/xlsdocs/risk_ex1.xls
Word Document Version: http://sw-eng.larc.nasa.gov/process/forms/wddocs/risk_ex1.doc
Adobe PDF File Version: http://sw-eng.larc.nasa.gov/process/forms/pdfdocs/risk_ex1.pdf

Attachment 3: Document 193
See e-mail attachment 'Document 193_v3.doc'
Note: Attachment 3 has been included on the following page.

Attachment 4: Langley Management System - Center Procedure - 5529
See e-mail attachment '5529.pdf' for LMS-CP-5529 and Revision B.

Attachment 3: Document 193 (Version 3)

DEVELOPMENT SCHEDULE FOR LOW, HIGH, AND CRITICAL CLASS SOFTWARE

PROJECT NAME	SOFTWARE CLASS	START DATE	END DATE	ASSIGNED EMPLOYEE OR CONTRACT COMPANY	SOFTWARE MANAGER (Indicate *)	ORG CODE	WORK PACKAGE OR WBS ELEMENT	FULL TIME EQUIVALENT (FTE)	Date SPMP Approved
PMACS	Low			SSI		NA	WHATSIT 8.0		
PMACS	Low		3/00	Julie Andrews	*	NA	WHATSIT 8.0	15%	